

Listing of Claims

1-17. (Canceled)

18. (new) A substrate processing method for heating a substrate to be processed to a predetermined temperature, the substrate being held by a holder and also accommodated in a processing container equipped with a heater, and further processing the substrate to be processed while supplying a processing fluid into the processing container, the method comprising the steps of:

moving the substrate to be processed close to a heating surface of the heater relatively thereby to heat the substrate to be processed to a processing temperature;

moving the substrate to be processed apart from the heating surface of the heater to a processing position after heating the substrate to the processing temperature; and

supplying the processing fluid into the processing container, wherein the holder and the heating surface of the heater are relatively moved close to and apart from each other intermittently or continuously.

19. (new) A substrate processing method for heating a substrate to be processed to a predetermined temperature, the substrate being held by a holder and also accommodated in a processing container equipped with a heater, and further processing the substrate to be processed while supplying a processing fluid into the processing container, the method comprising the steps of:

moving the substrate to be processed close to a heating surface of the heater relatively thereby to heat the substrate to be processed to a processing temperature;

moving the substrate to be processed apart from the heating surface of the heater to a processing position after heating the substrate to the processing temperature; and

supplying the processing fluid into the processing container,

wherein the holder is capable of moving in and out of a processing chamber thereby plunging into the processing chamber through the processing chamber, the substrate to be processed being supported by the holder horizontally, and the holder being moved vertically to make the holder and the heating surface of the heater close to and apart from each other relatively.

20. (new) A substrate processing method for heating a substrate to be processed to a predetermined temperature, the substrate being held by a holder and also accommodated in a processing container equipped with a heater, and further processing the substrate to be processed while supplying a processing fluid into the processing container, the method comprising the steps of:

moving the substrate to be processed close to a heating surface of the heater relatively thereby to heat the substrate to be processed to a processing temperature;

moving the substrate to be processed apart from the heating surface of the heater to a processing position after heating the substrate to the processing temperature; and

supplying the processing fluid into the processing container;

wherein in the step of moving the substrate close to the heating surface of the heater relatively, the substrate moved close to the heating surface does not come into contact with the heating surface.

21. (new) A substrate processing method as claimed in Claim 20, further comprising the steps of:

making the holder receive the substrate transferred from the exterior of the processing container at a delivery position before bringing the substrate and the heating surface of the heater into a relative closer relationship; and

discharging the processing fluid for processing from the interior of the processing container after supplying the processing fluid into the processing container.

22. (new) A substrate processing method as claimed in Claim 20, wherein the flowing direction of the processing fluid in a processing chamber is generally perpendicular to the close-and-apart moving direction of the holder and the heating surface of the heater.

23. (new) A substrate processing method as claimed in Claim 22, wherein the processing fluid is supplied so as to diffuse in the plane direction of the substrate arranged in the processing container and further bypass in a direction generally perpendicular to a diffusing surface of the substrate.

24. (new) A substrate processing method for heating a substrate to be processed to a predetermined temperature, the substrate being held by a holder and also accommodated in a processing container equipped with a heater, and further processing the substrate to be processed while supplying a processing fluid into the processing container, the processing container having a container body and a lid body, the method comprising the steps of:

- opening the lid body;
- making the holder receive the substrate transferred from the exterior of the processing container at a delivery position;
- moving the substrate to be processed close to a heating surface of the heater relatively;
- closing the lid body;
- heating the substrate to be processed to a processing temperature;
- moving the substrate to be processed apart from the heating surface of the heater to a processing position after heating the substrate to the processing temperature; and
- supplying the processing fluid into the processing container;
- discharging the processing fluid for processing from the interior of the processing container; and
- again opening the lid body, transferring the substrate from the processing position to the delivery position and unloading the substrate out of the processing container,
- wherein the lid body and the container body are separated by a plane along the substrate, and
- wherein a moving direction when the lid body relatively comes into contact with and relatively moves apart from the container body is substantially perpendicular to the substrate.

25. (new) A substrate processing apparatus comprising:

- a processing container for accommodating a substrate to be processed, the processing container having a supply port for supplying a processing fluid into the processing container;
- a holder for holding the substrate in the processing container;
- a heater provided to the processing container for heating the substrate to a predetermined temperature;
- a supply pipeline connected to the supply port;

- a valve interposed in the supply pipeline;
- a processing fluid source for supplying the processing fluid into the processing container through the supply pipeline;
- a close-and-apart moving mechanism for moving the substrate held by the holder close to or apart from a heating surface of the heater relatively;
- a connecting member arranged outside the processing container, for connecting the close-and-apart moving mechanism with the holder; and
- a controller for controlling the close-and-apart motion of the close-and-apart moving mechanism and the open-and-close operation of the valve,

wherein the holder includes

- a plurality of holding rods arranged so as to penetrate the processing container movably in a fluid-tight manner through a through-hole formed in the processing container and to project into the processing container, the holding rods being connected, at their parts outside the processing container, with the close-and-apart moving mechanism through the connecting member; and
- holding members arranged at respective tips of the holding rods to support the underside of the periphery of the substrate thereby holding the substrate horizontally, each of the holding members having a holding part for supporting the lower surface of the periphery of the substrate and a standing part formed to stand upwardly from the outer portion of the holding part over the upper surface of the substrate, the standing part having an inside surface inclined to the holding part so as to gradually reduce a thickness between the inside surface of the standing part and the outer circumference of the standing part as directed upward.

26. (new) A substrate processing apparatus comprising:

- a processing container for accommodating a substrate to be processed, the processing container having a supply port for supplying a processing fluid into the processing container;
- a holder for holding the substrate in the processing container;
- a heater provided to the processing container for heating the substrate to a predetermined temperature;
- a supply pipeline connected to the supply port;

a valve interposed in the supply pipeline;

a processing fluid source for supplying the processing fluid into the processing container through the supply pipeline;

a close-and-apart moving mechanism for moving the substrate held by the holder close to or apart from a heating surface of the heater relatively, the close-and-apart moving mechanism including a motor rotatable in both directions and a ball screw mechanism having a converting part to convert the rotational movement of the motor to a linear movement; and

a controller for controlling the close-and-apart motion of the close-and-apart moving mechanism and the open-and-close operation of the valve.

27. (new) A substrate processing apparatus comprising:

a processing container for accommodating a substrate to be processed, the processing container having a supply port for supplying a processing fluid into the processing container;

a holder for holding the substrate in the processing container;

a heater provided to the processing container for heating the substrate to a predetermined temperature;

a supply pipeline connected to the supply port;

a valve interposed in the supply pipeline;

a processing fluid source for supplying the processing fluid into the processing container through the supply pipeline;

a close-and-apart moving mechanism for moving the substrate held by the holder close to or apart from a heating surface of the heater relatively; and

a controller for controlling the close-and-apart motion of the close-and-apart moving mechanism and the open-and-close operation of the valve,

wherein the controller controls the close-and-apart moving mechanism in a manner that the substrate to be processed moves to a delivery position where the substrate is delivered into the processing container, an adjacent position where the substrate is opposed to the heating surface of the heater and a processing position where the substrate is apart from the heating surface of the heater over the adjacent position, and in a manner that the substrate at the processing position moves close to and apart from the heating surface of the heater intermittently

or continuously, and further controls the opening-and-closing operation of the valve in the supply pipeline in order to supply the substrate at the processing position with the processing fluid.

28. (new) A substrate processing apparatus comprising:

a processing container for accommodating a substrate to be processed, the processing container having a supply port for supplying a processing fluid into the processing container;

a holder for holding the substrate in the processing container;

a heater provided to the processing container for heating the substrate to a predetermined temperature;

a supply pipeline connected to the supply port;

a valve interposed in the supply pipeline;

a processing fluid source for supplying the processing fluid into the processing container through the supply pipeline;

a close-and-apart moving mechanism for moving the substrate held by the holder close to or apart from a heating surface of the heater relatively; and

a controller for controlling the close-and-apart motion of the close-and-apart moving mechanism in a manner that the substrate to be processed moves to a delivery position where the substrate is delivered into the processing container, an adjacent position where the substrate is opposed to the heating surface of the heater and a processing position where the substrate is apart from the heating surface of the heater over the adjacent position, the controller controlling the open-and-close operation of the valve in the supply pipeline in order to supply the substrate at the processing position with the processing fluid,

wherein the processing container includes a container body having its horizontal bottom part provided with the heater to form the heating surface, the container body having a fluid supply port and a drain port for the processing fluid, and a lid body being movable up and down and having another heater, the lid body being adapted so as to close an opening of the container body through a seal member, the moving of the substrate between the adjacent position and the processing position being carried out under the condition that the container body is closed by the lid body.

29. (new) A substrate processing apparatus comprising:

a processing container for accommodating a substrate to be processed, the processing container having a supply port for supplying a processing fluid into the processing container;
a holder for holding the substrate in the processing container;
a heater provided to the processing container for heating the substrate to a predetermined temperature;
a supply pipeline connected to the supply port;
a valve interposed in the supply pipeline;
a processing fluid source for supplying the processing fluid into the processing container through the supply pipeline;
a close-and-apart moving mechanism for moving the substrate held by the holder close to or apart from a heating surface of the heater relatively; and
a controller for controlling the close-and-apart motion of the close-and-apart moving mechanism and the open-and-close operation of the valve,
wherein the processing container includes a container body and a lid body, the lid body and the container body being separated by a plane along the substrate, a moving direction when the lid body relatively comes into contact with and relatively moves apart from the container body being substantially perpendicular to the substrate.

30. (new) A substrate processing apparatus as claimed in Claim 29,
wherein the container body has its horizontal bottom part provided with the heater to form the heating surface and has a fluid supply port and a drain port for the processing fluid,
wherein the lid body that is movable up and down and is adapted so as to close an opening of the container body through a seal member, and
wherein a moving of the substrate between an adjacent position where the substrate is opposed to the heating surface of the heater and a processing position where the substrate is apart from the heating surface of the heater over the adjacent position is carried out under condition that the container body is close by the lid body.

31. (new) A substrate processing apparatus as claimed in Claim 29, wherein the holder includes

a plurality of holding rods arranged so as to penetrate the lid body movably in a fluid-tight manner through a through-hole formed in the lid body and projected into the processing container, the holding rods being connected with the close-and-apart moving mechanism; and

a holding member arranged at respective tips of the holding rods to support the underside of the periphery of the substrate thereby holding it horizontally.

32. (new) A substrate processing apparatus comprising:

a processing container for accommodating a substrate to be processed, the processing container having a fluid supply port for supplying a processing fluid into the processing container and a drain port formed at opposing parts of a sidewall standing from the periphery of the horizontal bottom part, the processing container having a container body and a lid body being movable up and down in the vertical direction and also being adapted so as to close an opening of the container body through a seal member;

a holder for holding the substrate in the processing container;

a heater arranged in a horizontal bottom part of the container body forming the heating surface for heating the substrate to a predetermined temperature;

a supply pipeline connected to the supply port;

a valve interposed in the supply pipeline;

a processing fluid source for supplying the processing fluid into the processing container through the supply pipeline;

a close-and-apart moving mechanism for moving the substrate held by the holder close to or apart from a heating surface of the heater relatively; and

a controller for controlling the close-and-apart motion of the close-and-apart moving mechanism and the open-and-close operation of the valve,

wherein the processing container has a communication path to communicate the fluid supply port with the interior of the processing container, the communication path having a bypass part having a diffusion groove extending from the fluid supply port to both sides thereof and a sagging piece plunging into the diffusion groove.